The U.S. Department of Energy's Office of Science: Steward of 10 World-Class National Laboratories

July 2008

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Introduction
Steward of 10 National Laboratories

The Department of Energy's Office of Science is the steward of 10 world-class laboratories, which often are called the "crown jewels" of our national research infrastructure. The national laboratory system, created over a half-century ago, is the most comprehensive research system of its kind in the world. These laboratories perform research and development that is not well suited to university or private sector research facilities because of its scope, infrastructure, or multidisciplinary nature, but for which there is a strong public and national purpose. A high level of collaboration among all of the national laboratories in the use of world-class scientific equipment and supercomputers, facilities, and multidisciplinary teams of scientists increases their collective contribution to DOE and the Nation, making the laboratory system more valuable as a whole than as the sum of its parts.

Five of the Office of Science national laboratories are multi-program facilities:

- Argonne National Laboratory
- Brookhaven National Laboratory
- Lawrence Berkeley National Laboratory
- Oak Ridge National Laboratory
- Pacific Northwest National Laboratory.

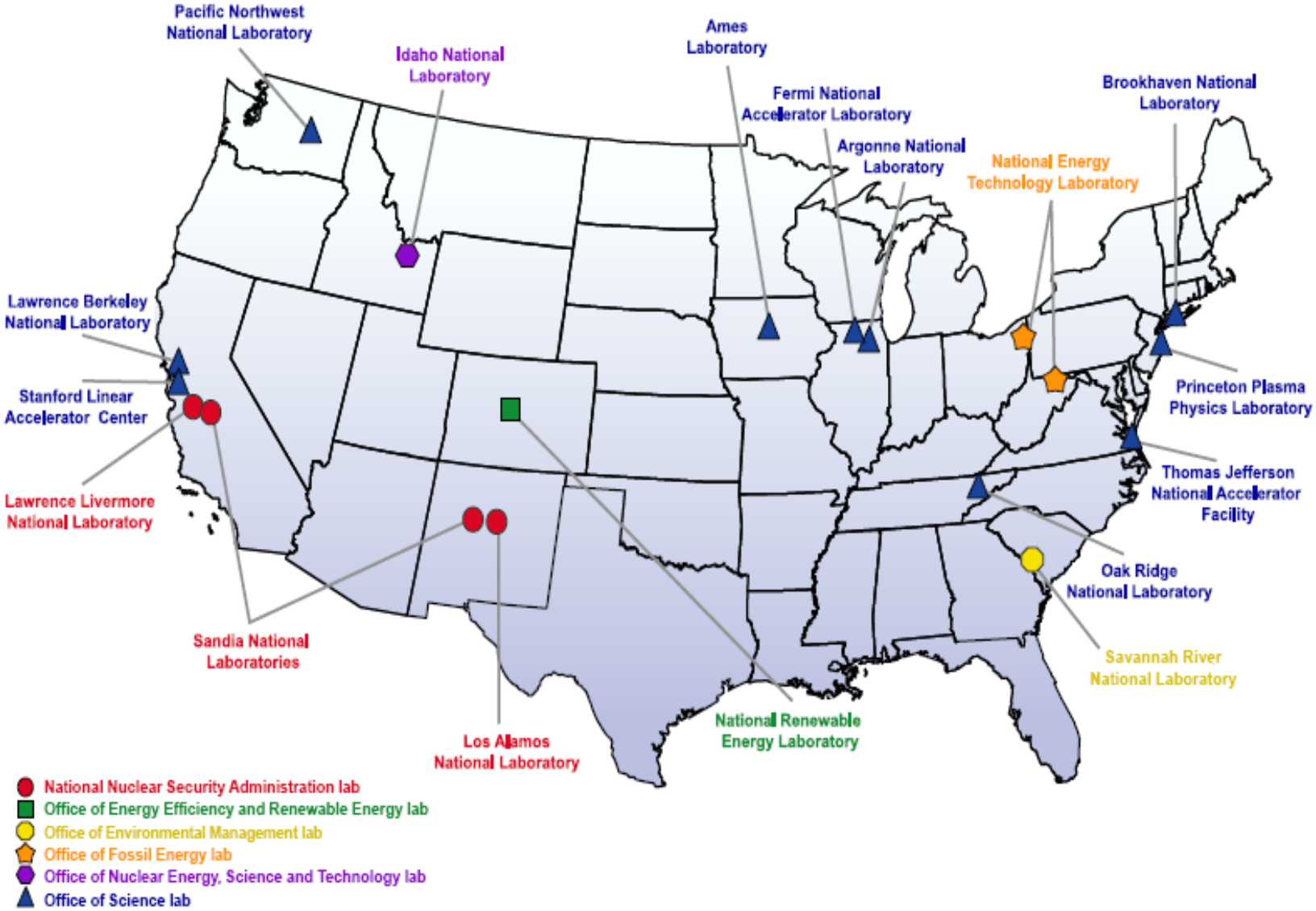
The other five Office of Science national laboratories are single-program facilities:

- Ames Laboratory
- Fermi National Accelerator Laboratory
- Thomas Jefferson National Accelerator Facility
- Princeton Plasma Physics Laboratory
- Stanford Linear Accelerator Center.

The Office of Science also funds research and development projects conducted at these additional national laboratories, which are overseen by other DOE offices:

- Idaho National Laboratory (DOE's Office of Nuclear Energy, Science and Technology)
- Lawrence Livermore National Laboratory (DOE's National Nuclear Security Administration)
- Los Alamos National Laboratory (DOE's National Nuclear Security Administration)
- National Energy Technology Laboratory (DOE's Office of Fossil Energy)
- National Renewable Energy Laboratory (DOE's Office of Energy Efficiency and Renewable Energy)
- Sandia National Laboratory (DOE's National Nuclear Security Administration)
- Savannah River National Laboratory (DOE'S Office of Environmental Management).

Department of Energy National Laboratories



AMES LABORATORY
United States Department of Energy

Leadership in Science

Ames Laboratory conducts research in various areas of national concern, including the synthesis and study of new materials, energy resources, high-speed computer design, and environmental improvement. Located in Ames, IA, on the Iowa State University campus, the laboratory was founded in 1947 following work to produce purified uranium for the Manhattan Project. Today, laboratory scientists are actively involved in innovative research, science education programs, the development of applied technologies, and the quick transfer of such technologies to industry. Ames Laboratory operates on a budget of approximately $30 million, and employs more than 425 full and part-time staff, including 250 scientists and engineers. Graduate students make up over 21% of the work force. Another 300 personnel are non-paid associates in departments across Iowa State University. The laboratory supplies roughly 17% of the federal research funding received by Iowa State University, which runs the lab for the U.S. Department of Energy's (DOE) Office of Science.

Single-Program Laboratory

Ames Laboratory primarily conducts research supported by DOE's Office of Science. Ames Laboratory is also funded by the Office of Energy Efficiency and Renewable Energy, the Office of Fossil Energy, and the Office of Defense Nuclear Nonproliferation. Its work for others program conducts work for other federal agencies, including the National Institute of Justice and the Department of Defense, and industry.

Mission

Ames Laboratory's mission focus is on materials science, engineering, analytical instrumentation and chemical sciences that provides expertise to the Department of Energy (DOE) laboratory system in the areas of energy and environmental improvement. Inherent in this mission is the transfer of technologies to improve industrial competitiveness, and the education the next generation of scientists and engineers.

Core Competencies

- Materials design, synthesis and processing;
- Analytical instrumentation/device design/fabrication, materials characterization, x-ray and neutron scattering, solid-state Nuclear Magnetic Resonance (NMR), spectroscopy/microscopy;
- Catalysis;
- Condensed matter theory; and
- Separation science.

Specialized Research Center

Materials Preparation Center (MPC) provides advanced materials to industry, university, and government research centers.

Lab-at-a-Glance

Location: Ames, IA

Type: Single-program laboratory

Contract Operator: Iowa State University (ISU) of Science and Technology

Responsible Field Office: Ames Site Office

Website: http://www.ameslab.gov/

Physical Assets:

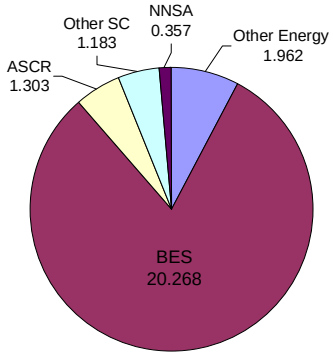
- 10 acres (lease–long term, no cost)
- 12 buildings
- 327,664 GSF in Active Operational Buildings
- Replacement Plant Value: $62.1M
- Deferred Maintenance: $1.5M
- Asset Condition Index:
  - Mission Critical 0.98 (Excellent)
  - Mission Dependent 0.96 (Good)
- Asset Utilization Index: 0.98 (Excellent)

Human Capital:

- 300 Full-time equivalent employees;
- 250 ISU grad/undergrad students employees and associates
- 200 Facility users, visiting scientists, and associates

FY 2007 Total DOE Funding: $25.1M

FY 2007 DOE Funding by Source
PALS data (BA in Millions):



FY 2007 Non-DOE Funding: $1.4M

Recent Scientific Achievements

- Material for magnetic refrigeration that improves refrigerator efficiency by an estimated 40 percent.
- Invented new stronger, easier to use lead-free solder which stands up better in high-heat conditions.

- Designed/demonstrated materials that make it easier to develop optical lasers, optical computers and solar cells.
- Discovered compounds that could be used to produce practical materials highly resistant to corrosion at high temperatures.
- Invented a solvent-free way to produce organic compounds in solid state, which could lead to a solution for high-capacity, safe hydrogen storage needed to make hydrogen-powered vehicles viable.
- Integrated 3-D computational fluid dynamics software with detailed chemistry models for fuel spray combustion simulation.
- Developed a component of SPARSKIT's state of the art iterative methods for solving sparse linear systems.
- Developed the first metamaterial component operating in the visible spectrum.
- Developed and first successful application of ARPES microscopy; developed highest flux/energy resolution ARPES spectrometer.
- Invented a new class of magnetic materials: RT_2Zn_{20}.
- First growth of MgB_2 single crystals in a US Lab.
- Developed a novel interdisciplinary approach using bacterial mineralization proteins and self-assembling block copolymers for controlled synthesis and assembly of uniformly sized superparamagnetic nanocrystals. This approach draws inspiration from nature, as the skins of many migratory and homing birds and animals contain organized aggregates of magnetite nanocrystals that exhibit superparamagnetic properties at ambient temperatures.
- Developed new solid-state NMR techniques to characterize nanocomposites.
- Invented novel nanoparticle-based solid catalysts for highly efficient production of biodiesel from vegetable oils, low-quality animal fats, and restaurant waste oils. These catalysts are environmentally friendly and can be reused and recycled many times. This technology will significantly lower the cost of biodiesel production and will allow the usage of non-food-based oils and fats for biodiesel synthesis.
- Invented a non-invasive mesoporous silica nanoparticle-based (MSN) gene delivery system for plant transformation; the first demonstration of gene-carrying porous nanoparticles that can penetrate cell wall-containing plant tissues.
- Discovered a process that makes it possible to achieve very low-sulfur diesel fuel.

Awards

- 16 R&D 100 Awards since 1984, the latest to Dr. M. Bryden in 2006 for texture based engineering tools.
- In 2008, Dr. K. Gschneidner Jr. received the Acta Materialia Gold Medal, considered by many to be the top award worldwide in the field of materials research.
- Dr. J. Corbett received the American Chemical Society's 2008 F. Albert Cotton Award in Synthetic Inorganic Chemistry.
- In 2007, Dr. I. Anderson received the Distinguished Scientist/Engineer Award by the Electronic, Magnetic & Photonic Materials Division of the Minerals, Metals, & Materials Society; only the second person selected for the award.
- Dr. C. Soukoulis received the Descartes Prize for Excellence in Scientific Collaborative Research in FY2006 for his contributions to the field of left-handed materials.

Argonne NATIONAL LABORATORY

Leadership in Science

Argonne National Laboratory is one of the U.S. Department of Energy's premier research centers, located in the nation's industrial heartland. Argonne is a direct descendant of the WWII Manhattan Project and was designated the Nation's first national laboratory in 1946. The University of Chicago has played a key role in managing the laboratory throughout its history. Today, with a research portfolio of $551M and approximately 1,400 scientists and engineers, Argonne plays a key role as an R&D engine of innovation that complements industry and academia in maintaining the nation's economic growth and competitiveness.

Multi-Program Laboratory

Argonne conducts research for the following Office of Science programs: Basic Energy Sciences, Advanced Scientific Computing Research, Biological and Environmental Research, Nuclear Physics, High Energy Physics and Fusion Energy Sciences. Argonne also conducts research for DOE's Offices of Energy Efficiency and Renewable Energy, Nuclear Energy, Fossil Energy, Civilian Radioactive Waste Management, Environmental Management, and the National Nuclear Security Administration.

Mission

Argonne's mission is to deliver breakthrough materials that make the nation energy-efficient, economically competitive, environmentally sound, and physically secure. We work to accelerate innovation in science and technology by understanding and manipulating properties at the nuclear, atomic, molecular and nano-scales — controlling molecules, atoms, and electrons — to create entirely new classes of materials with desired outcomes that further scientific discovery and enhance energy production, storage and use.

Core Competencies

- Synthesis, characterization, and modeling of chemicals and materials
- Hard X-ray and nanoscale research
- Leadership computing, numerical libraries and software tools
- Accelerator technologies
- Modeling, simulation and visualization
- Structural biology/genomics and bioinformatics
- Catalysis, energy storage, and energy conversion systems
- Nuclear structure, particle physics, and nuclear astrophysics
- Nuclear fuel cycle, separation science, and reactor design
- Transportation science and engineering
- Non-proliferation, threat reduction, infrastructure assurance and risk analysis

Lab-at-a-Glance

Location: Argonne, IL

Type: Multi-program lab

Contract Operator: UChicago Argonne, LLC

Responsible Site Office: Argonne Site Office

Website: http://www.anl.gov/

Physical Assets:

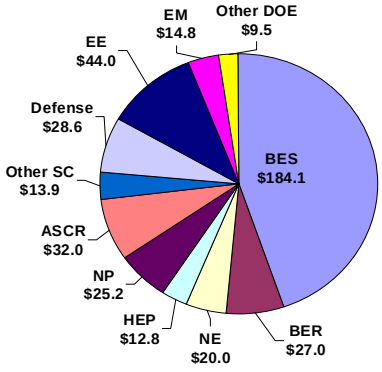
- 1,500 acres and 99 buildings
- 4.6M GSF in active operational buildings
- 83K GSF in non-operational buildings
- Replacement plant value: $1.6B
- Deferred maintenance: $84.4M
- Asset Condition Index
  - Mission Critical: 0.947 (Adequate)
  - Mission Dependent: 0.945 (Adequate)
- Asset Utilization Index: 0.966 (Good)

Human Capital:

- 3,000 employee FTEs (including "term" employees and post-docs)
- 4,250 facility users, visiting scientists, and students in FY 2007
- 9,000 badged users

FY 2007 Total DOE Funding: $412M

FY 2007 DOE Funding by Source
Argonne data (BA in Millions):



FY 2007 Non-DOE Funding: $119M
FY 2007 Dept. of Homeland Security: $20M

Major User Facilities

- The **Advanced Photon Source (APS)** provides a high-brightness, high-energy electron beam, which makes it a unique source of high-energy X-rays for scattering and imaging studies with an optimal time structure for time-resolved research.
- The new **Center for Nanoscale Materials (CNM)** combines advanced scanning probes (including the X-ray nanoprobe), organic and inorganic synthesis, and nanofabrication with theory and modeling.
- The **Electron Microscopy Center (EMC)** is a facility for exploring inorganic and organic materials on the atomic scale using advanced microstructural characterization methods.
- The **Argonne Tandem-Linac Accelerator System (ATLAS)** provides access to a superconducting linear accelerator for heavy ions, the energy domain best suited to study the properties of the nucleus, the core of matter, & fuel of stars.
- The **Argonne Leadership Computing Facility (ALCF)** offers access to a highly integrated, low-power-operation petascale computing platform with an unprecedented level of concurrency and a suite of tools that allow scientists to tune and understand their codes to further research in energy systems, life sciences, and basic sciences.
- The **Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF)** provides highly instrumented ground stations, a mobile facility, and an aerial vehicles program for studying cloud formation processes and influences on radiative transfer & measures other parameters that determine the atmosphere's radiative properties.

Recent Scientific and Technological Achievements

- Discovery of a "superinsulator," a new fundamental state of matter that opens new directions of inquiry in condensed matter physics and breaks ground for a new generation of microelectronics.
- The APS has generated 50% more protein structures, and more high-impact structural biology publications, than any other x-ray source in the world.
- The newest version of the Greenhouse gases, Regulated Emissions and Energy use in Transportation (GREET) model will provide researchers with even more tools to evaluate and compare the environmental impacts of new transportation fuels and advanced vehicle technologies.
- Discovery of how the structure of plutonium nanocluster contaminants causes them to spread further in groundwater, increasing the risk of human and animal exposure.
- Development of a new computational technology that provides new insight into the relationship between viruses and their environments by identifying subtle differences in the metabolic processes of microbial communities.
- Development of a biochip that can save lives by rapidly screening patients for immune responses to proteins from cancer cells or disease-causing microorganisms.
- The most neutron-rich matter that can be made on Earth—the nucleus of the helium-8 atom—has been created, trapped and characterized by Argonne scientists.
- Significant contributions to the design and construction of the Hadronic Tile Calorimeter, which will measure the energy produced after subatomic particles called hadrons strike the sensor array.
- Catalytic alkane activation via synthesis, physical and chemical characterization and modeling of supported size-selected metal clusters.
- Development of composite cathode materials (now patented and licensed by Argonne for commercial production and sale worldwide) for lithium-ion batteries, which result in longer-lasting, safer batteries for hybrid-electric vehicles, cell phones, laptop computers and other applications.
- Made the first 100-ps x-ray "snapshots" that show turbulence in a fuel spray.
- Discovered, with x-rays under extreme conditions, a new family of hydride superconductors.

Awards

- Three Nobel Prizes
- Two Enrico Fermi Awards
- Nine E.O. Lawrence Awards
- Three members of the National Academy of Sciences
- Bardeen Prize
- Kamerlingh Onnes Prize
- 98 R&D 100 Awards

Leadership in Science

Brookhaven National Laboratory, operated by Brookhaven Science Associates for DOE, has a broad mission to produce excellent science and advanced technology, safely and environmentally responsibly, with the cooperation and involvement of the local, national, and scientific communities. Established in 1947, Brookhaven today is a world leader in accelerator-based science and technology. The Laboratory's two large user facilities, the Relativistic Heavy Ion Collider and the National Synchrotron Light Source, can probe nearly the entire range of scales – from human-sized to elementary particles – of interest to most areas of the physical and biological sciences. Located on Long Island in Upton, NY, Brookhaven employs 2700 scientists, engineers, technicians, and support staff and hosts approximately 4300 guest researchers annually. The Laboratory operates on an annual budget of approximately $500 million.

Multi-Program Laboratory

Brookhaven is a multi-program laboratory, with DOE's Office of Science providing about 75 percent of funding. The majority of Brookhaven's research programs fall within various program offices under the Office of Science, as follows:

- Offices of Nuclear and High Energy Physics: Includes support for the operation of the Relativistic Heavy Ion Collider Complex, the RHIC Computing Facility, the U.S. ATLAS Tier I Computing Facility and Analysis Support Center, the Accelerator Test Facility, and the experimental and theoretical research programs in Collective Quantum Chromodynamics Phenomena and Physics of the Universe.
- Office of Basic Energy Sciences: Includes support for the operation of the National Synchrotron Light Source, the Center for Functional Nanomaterials, and research in nano-, materials-, and chemical-sciences.
- Office of Biological and Environmental Research: Includes support for the Protein Crystallography Research Resource, biological imaging studies, radiotracer development, structural biology, molecular genetics, and atmospheric chemistry.

Mission

Brookhaven supports DOE's strategic missions by advancing photon sciences and energy-related research and applying them to 21st Century problems of critical importance to the Nation and advancing fundamental research in nuclear and particle physics to gain a deeper understanding of matter, energy, space, and time.

Core Competencies

- Conceptualization, design, construction, & operation of advanced accelerator systems, detectors, magnets, and instrumentation.

Lab-at-a-Glance

Location: Upton, NY

Type: Multi-program lab

Contract Operator: Brookhaven Science Associates

Responsible Field Office: Brookhaven Site Office

Website: http://www.bnl.gov/

SC Physical Assets:

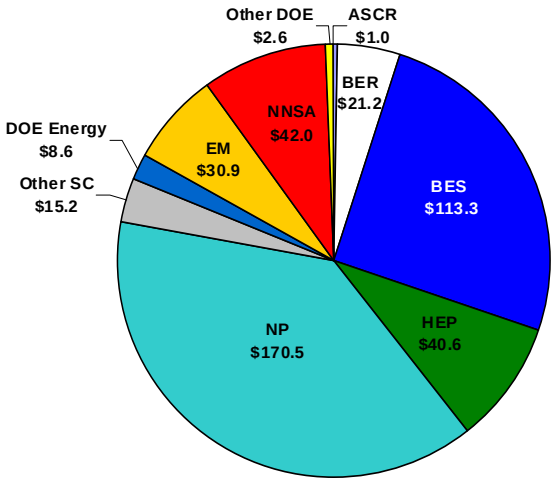
- 5320 acres and 341 buildings
- 4.0M GSF in Active Operational Buildings
- 69K GSF in Non-Operational Buildings
- 2007 Replacement Plant Value: $1.754B
- Deferred Maintenance: $107M
- Asset Condition Index:
  - Mission Critical 0.94 (Adequate)
  - Mission Dependent 0.93 (Adequate)
- Asset Utilization Index: 0.98 (Good)

Human Capital:

- 2600 full time employees (9/31/07)
- 2700 full time employees (3/31/08)
- 4300 Facility Users and Visiting Scientists

FY 2007 Total DOE Funding: $445.8M

FY 2007 DOE Funding by Source
(BA in Millions):



FY 2007 Non-DOE Funding: $43.7M
FY 2007 Dept. Of Homeland Security: $3.2M

- Synchrotron radiation science and technology.
- Imaging (including radiotracer chemistry, biological structure, and instrumentation).
- Development and application of advanced software and computing facilities to high energy and nuclear physics experiment and theory.
- Synthesis and characterization of complex and nano-structured materials.

Major User Facilities

- **Relativistic Heavy Ion Collider**, a unique world-class accelerator facility for colliding intersecting symmetric or asymmetric beams of nuclei and polarized protons.
- **National Synchrotron Light Source**, provides researchers with intense light spanning the electromagnetic spectrum from the infrared through the ultraviolet to the x-ray region. Plans for the National Synchrotron Light Source-II, the world's highest brightness synchrotron source, which will enable qualitative advances in discovery potential in many fields, are underway. It is anticipated that it will be fully operational in 2015.
- **Center for Functional Nanomaterials**, provides state-of-the-art capabilities for the fabrication and study of nanoscale materials that address the Nation's challenges in energy security.
- **U.S. ATLAS Tier I Computing Facility and Analysis Support Center**, serves as the principal center to supply capability and capacity computing to the U.S. ATLAS physics program and provides expertise in all aspects of ATLAS software and physics analysis that will enable physics discoveries.
- **Accelerator Test Facility**, the U.S. proving ground for new concepts in accelerator physics.
- **NASA Space Radiation Laboratory**, used to learn about the possible risks to human beings exposed to radiation in space, as well as to develop shielding materials for such a risk.

Recent Scientific Achievements

- 2003 Nobel Prize in Chemistry awarded to biophysicist Roderick MacKinnon, M.D., for structural and mechanistic studies of ion channels carried out at the National Synchrotron Light Source.
- 2002 Nobel Prize in Physics given to chemist Raymond Davis Jr. for solar neutrino research.
- At the Relativistic Heavy Ion Collider, creation of a new state of strongly interacting matter with near-perfect liquid properties, giving insight into the earliest moments of the universe.
- Invention of new nanocatalysts for fuel cells that contain ten times less of costly platinum metal and have already met the DOE 2010 activity targets.
- Synthesis and characterization of DNA-directed three-dimensional ordered crystalline structures of nanoparticles.
- Brain imaging studies that have gained international recognition.

Awards

- Six Nobel Prizes: five in Physics and one in Chemistry
- The 1985 and 2002 National Medal of Science
- The 1991 and 2000 Wolf Prize
- The 1986, 1987, 1988, 1998, and 2003 Fermi Award
- Eleven Lawrence Awards
- Nine Presidential Early Career Awards for Scientists and Engineers
- Numerous R&D 100 Awards

Fermilab

Leadership in Science

Fermi National Accelerator Laboratory, also known as Fermilab, is the largest U.S. laboratory dedicated to research in particle physics. The laboratory was established in 1967 on 6800 acres of northern Illinois land, in Batavia, IL, about 45 miles west of Chicago. The original Fermilab Main Ring became the world's highest energy accelerator when it started operation in 1971. The Tevatron, commissioned in 1983, was the first large proton accelerator based on superconducting magnet technology. The laboratory staff includes 1950 full-time employees, and the budget for FY 2007 is $347.7 million. Approximately 2300 scientists from 210 institutions in 35 states and 27 countries carry out research at the energy frontier, the highest-energy environment for discovery in the world today. Fermilab scientists also pursue research in particle astrophysics and cosmology, exploring the convergence of the inner space of the tiniest elementary particles and the outer space of the structure, and evolution of the universe. Fermi Research Alliance manages and operates the laboratory for DOE's Office of Science.

Single-Program Laboratory

Fermilab is a single-program laboratory funded by DOE's Office of Science's Office of High Energy Physics.

Mission

Fermilab's mission is to provide the facilities and resources necessary to understand the fundamental nature of matter and energy and to conduct research at the frontiers of high energy physics and related disciplines.

Core Competencies

Fermilab maintains world-leading capabilities in these areas:

- Construction and operation of accelerator facilities for particle physics
- Construction and operation of experimental facilities for particle physics and particle astrophysics
- Research, design, and development of accelerator technology
- High-performance scientific computing and networking
- International scientific collaboration
- Theoretical particle physics and astrophysics

Lab-at-a-Glance

Location: Batavia, IL

Type: Program Dedicated Lab

Contract Operator: Fermi Research Alliance, LLC

Responsible Site Office: Fermi Site Office

Website: http://www.fnal.gov

Physical Assets:

- 6,800 acres
- 355 buildings

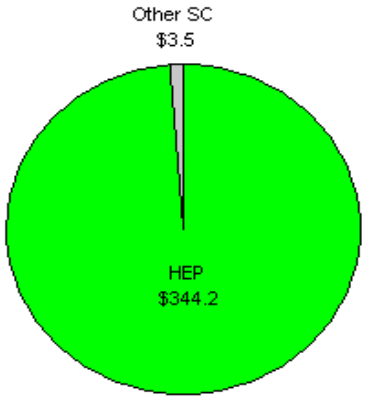
Human Capital:

- 1950 employees;
- 2300 Facility Users and Visiting Scientists, including
- 615 Students (Undergraduate and Graduate)

FY 2007 Total DOE Funding: $347.7M

FY 2007 DOE Funding by Source

(BA in millions)



FY 2007 Non-DOE Funding: $0.6

Major User Facilities

- **The four-mile-circumference Tevatron proton-antiproton collider**, the world's most powerful particle accelerator.
- **The Booster accelerator**, providing beam for the MiniBooNE neutrino experiment.
- **The Main Injector accelerator**, providing beam for the NuMI (Neutrinos at the Main Injector) experiment.
- **The two 5,000-ton collider detectors, CDF and D Zero**, each serving an international collaboration of more than 500 university physicists.
- **The long-baseline MINOS experiment**, officially launched in 2005, is studying the question of neutrino mass and the neutrino mass hierarchy.

- **The short-baseline MiniBooNE experiment** has refuted evidence for a fourth type of neutrino, confirming the Standard Model.
- **The CMS (Compact Muon Solenoid) experiment at CERN**, for which Fermilab serves as host for the U.S. collaboration component (US CMS), and as home for the US CMS research program involving nearly 400 scientists.
- **The Lattice Gauge Theory Computing Facility**, where approximately 60 user theorists work with the theory of quantum chromodynamics with teraflop computing power.
- **The Particle Astrophysics Center**, encompassing the Sloan Digital Sky Survey, the Pierre Auger Cosmic Ray Observatory, and the Cryogenic Dark Matter Search, and proposed projects including the SuperNova Acceleration Probe of the Joint Dark Energy Mission, and the Dark Energy Survey, where Fermilab is building a camera for the Cerro Tololo Interamerican Observatory (CTIO) in Chile.

Recent Scientific Achievements

Discoveries at Fermilab during the 40 years of its history have helped to define the growing understanding of the fundamental nature of the universe and how it works. The discovery of the bottom quark in 1977 and the top quark in 1995, and the first observation of the tau neutrino in 2000, among other Fermilab achievements, have shaped the current picture of the basic structure of matter, known to scientists as the Standard Model of Fundamental Particles and Forces. Now the stage is set for new discoveries and new physics at the Tevatron in the months and years ahead.

Awards

Presidential Medal of Technology, presented to four Fermilab scientists for development and construction of the Tevatron.

Thomas Jefferson National Accelerator Facility (TJNAF), or Jefferson Lab (JLab), located in Newport News, Virginia is a program-dedicated laboratory for Nuclear Physics within the Department of Energy's Office of Science. Currently operated by the Jefferson Science Associates, LLC for the Office of Science, TJNAF began operations in 1995 with the completion of the Continuous Electron Beam Accelerator Facility (CEBAF), a unique international electron-beam user facility for the investigation of nuclear and nucleon structure based on the underlying quark structure. Its research and engineering staff are world experts in superconducting radio-frequency technologies that are integral to providing expertise for cost effective accelerators of the future. JLab has an international user community of 1,175 researchers whose work has resulted in scientific data for 139 experiments, more than 234 *Physics Letters* and *Physical Review Letters* published, and 686 publications in other refereed journals. Collectively, there have been over 20,000 citations from work completed at CEBAF. Research conducted at TJNAF also contributes to thesis research material for about one-third of all U.S. Ph.D.s awarded annually in Nuclear Physics. The Lab's outstanding science education program for K-12 students, undergraduates and teachers builds critical knowledge and skills in the physical sciences. The Lab continues to receive recognition for these programs including the April 2008 award from the Virginia Math and Science Coalition Program for the Lab's DOE-ACTS teacher academy held each summer.

Single-Program Laboratory

Jefferson Lab is a program-dedicated laboratory funded by the Office of Nuclear Physics in DOE's Office of Science.

Mission

The primary mission of Jefferson Lab is to discover the fundamental quark-gluon structure of matter.

Core Competencies

1. Nuclear Physics – experimental, theoretical, computational
2. Accelerator Science and Technology – srf, high brightness, polarized electron beams, and cryogenics

The Office of Science believes that these core competencies will enable TJNAF to fully deliver its mission, to support initiatives requiring its core competencies across the DOE laboratory system, and to pursue its vision for scientific excellence and pre-eminence in the areas of nuclear physics:

- The structure of the nuclear building blocks including: the nucleon's charge and magnetization distribution; the separation of the individual quark contributions to those distributions of charge and magnetization; the degrees-of-freedom governing the nucleon's excitation; the internal structure of the nucleon in the valence region, notably the distribution of momentum and spin on the valence quarks; the nature of quark confinement; and the experimental and theoretical tools necessary to carry out a program of nucleon tomography.
- The structure of nuclei including: the nuclear interior with controlled impurities; short-range component of the nucleon-nucleon interaction in nuclei; the neutron radius of ^{208}Pb; and the underlying quark-gluon structure of the nucleus.
- Symmetry tests in nuclear physics, including the proton weak charge, to test predictions of the Standard Model.

Lab-at-a-Glance

Location: Newport News, VA

Type: Program Dedicated Lab

Contract Operator: Jefferson Science Associates, LLC (JSA)

Responsible Site Office: Thomas Jefferson Site Office

Website: http://www.jlab.org

Physical Assets:

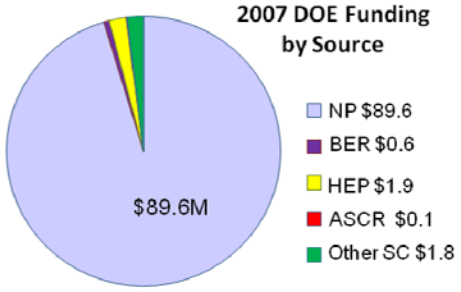
- 206 Acres (includes SURA land)
- 70 Buildings
- 695K SF in DOE Buildings
- Replacement Plant Value: $185M
- Deferred Maintenance: $9.5M
- Asset Condition Index:
  - Mission Critical 0.96 (Good)
  - Mission Dependent 0.78 (Fair)
- Asset Utilization Index: 1.0 (Excellent)

Human Capital:

- 650 FTEs
- 2,200 Facility Users and Visiting Scientists

FY 2007 Total DOE funding: $94M

DOE Funding by Source (in Millions):



FY 2007 Non-DOE Funding: $10M

- Enabling technologies and emerging fields - photon science and electron ion colliders – including advanced radiofrequency superconductivity, 2K cryogenic engineering technology Energy Recovering Linacs (ERL), advanced high power free electron lasers, and electron-light ion collisions at ultra-high luminosity.

Major User Facilities

- **Continuous Electron Beam Accelerator Facility (CEBAF)**, a continuous-wave, upgradeable 6 billion electron volt (GeV) beam capable of delivering highly polarized electron beam to three separate experimental halls simultaneously, each equipped with complementary experimental apparatus. JLab is currently upgrading CEBAF's energy to 12 GeV; the number-one ranking recommendation of the 2007 NSAC Long Range Plan that is fully supported by the Office of Science. The Upgrade's higher energy plus construction of an additional experimental hall and experimental apparatus in the existing halls will enable new insights into the structure of the nucleon, the transition between the hadronic and quark/gluon descriptions of nuclei, and the nature of confinement.
- **Free-Electron Laser (FEL)**, a superconducting radiofrequency-based laser that has delivered the world's record of 15 kilowatts (kW) of infrared light, provided proof-of-principle for energy-recovering linacs, and is now spawning a new generation of FELs built on its design.

Recent Scientific Achievements

- World leading capabilities for studies of parity violation have led to major advances in our understanding of the role of strange quarks in nuclei. In contrast with the expectations of many models, the strange quarks have been shown to contribute less than 5% of the magnetic moment of the proton.
- The determination of the strange magnetic moment and charge radii at Jefferson Lab have provided confirmation of the lattice QCD calculations of these critical "disconnected contributions" – the first time such terms, analogous to the famous Lamb shift in atomic physics, have been determined.
- Measurements of high momentum nucleons knocked out of nuclei have provided new insight into the nature of short-range correlations, confirming the critical role played by the tensor force.
- The unique capabilities of Jefferson Lab in terms of polarization, duty factor and intensity made enabled the measurement of the electric form factor by a completely new technique, revealing novel behavior and changing the short distance charge distribution of the proton dramatically in comparison with earlier work from SLAC.
- High precision tests of parity violating electron scattering, aimed at determining the strange content as noted earlier, provided a major increase in the precision with which the Standard Model is tested. This data raised the lower limit on the scale of possible new physics beyond the Standard Model to almost 1 TeV.
- Theoretical speculations about the possible conformal nature of QCD at low energy have received unexpected support from highly accurate studies of the Bjorken sum-rule in that regime.
- Studies of spin dependent deep-inelastic scattering have doubled the data-base for spin structure functions, leading to a very important limit on the amount of the nucleon spin carried by polarized gluons (less than 0.3). This, together with pioneering measurements of generalized parton distributions of the neutron, has contributed important information concerning the resolution of the famous proton spin problem.
- Studies of the transition form factors to the Roper resonance strongly suggest that it does not have a large gluonic component in its wave function, in contrast with widely held theoretical ideas.

Awards

- Two R&D 100 Awards
- White House "Closing the Circle Award" 2007

Lawrence Berkeley National Laboratory (LBNL), founded in 1931, has been a driving force behind serious investigations into particle physics and the nature of matter and energy in the universe. Since its inception as the birthplace of accelerator-based physics and nuclear medicine, LBNL evolved into a multidisciplinary research facility that has a mission focus of: understanding and advancing physical, chemical, biological, and earth systems for sustainable energy and environmental solutions; conducting ultrafast science to engineer systems at quantum, atomic, and molecular scales, understanding and fabricating nanostructured materials and devices; advancing physics and cosmology, conducting computational science of scale, and developing new scientific approaches to the science and engineering of complex biosystems. As a national laboratory with global impact, LBNL leadership continues to strengthen the culture that created LBNL and sustain DOE science leadership.

Multi-Program Laboratory

LBNL is a multi-program DOE research institute that receives most of its funding from the Office of Science in the following programs: Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics, and Nuclear Physics. LBNL is also funded by DOE's Office of Energy Efficiency and Renewable Energy; Office of Civilian Radioactive Management; Office of Fossil Energy; and Office of Nonproliferation and National Security.

Mission

LBNL's mission advances three distinct goals and subgoals for DOE and the Nation:

- Solve the most pressing and profound scientific problems facing humankind
  - Basic science for a secure energy future
  - Understand living systems to improve the environment, health, and energy supply
  - Understand matter and energy in the universe
- Build & safely operate leading scientific facilities for the nation
- Train the next generation of scientists and engineers

Core Competencies

- Sustainable energy science and technology, including supply, energy storage, and efficiency;
- Soft x-ray and ultrafast science, photon and particle beams, including national user facilities;
- Nanoscience, materials synthesis, and characterization;
- Multidisciplinary and integrated biology and environmental science, including climate change;
- Computational science, applied mathematics, and electrical and mechanical engineering; and
- Advanced detector systems for astrophysics, high energy physics, and nuclear science.

2. Lab-at-a-Glance

Location: Berkeley, CA

Type: Multi-program lab

Contract Operator: University of California

Responsible Field Office: Berkeley Site Office

Website: http://www.lbl.gov/

Physical Assets:

- 202 acres (leased at no cost)
- 108 Buildings
- 1.85M GSF
- Replacement Plant Value: $964.3M

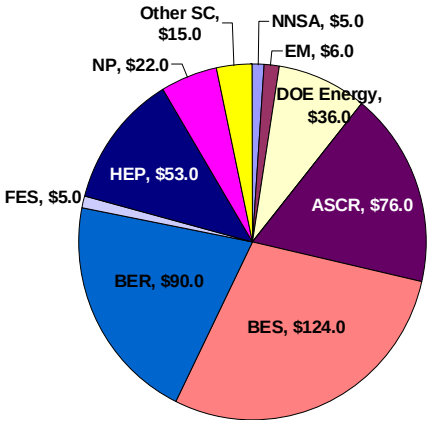
Human Capital:

- 2,708 FTE
- 3,642 Total employees
  - 272 Faculty
  - 298 Postdocs
  - 321 Graduate Students
  - 183 Undergraduates
  - 582 Support Staff
  - 1,354 Technical Staff
  - 632 Scientists and Engineers
- 6,935 Facility Users and Visiting Guests

FY 2007 Total DOE Funding: $431.7M

FY 2007 DOE Funding by Source

PALS data (BA in Millions):



FY 2007 Non-DOE Funding: $117.3M (21%)
FY 2007 Dept. Homeland Security: $2.9M

Business Lines

- Characterize and design energy processes and materials through electron dynamics
- Advance science and technology for a globally sustainable energy future
- Conduct multiscale science and engineering of complex biological systems
- Enable extreme scale computational science
- Understand the nature of matter and energy in the universe

Major User Facilities

Berkeley Lab designs, builds, and operates leading national scientific facilities in support of DOE missions. These facilities are used by thousands of scientists from government, universities and industry:

- **Advanced Light Source**, one of the world's brightest sources of ultraviolet and soft x-ray synchrotron radiation delivering advanced microscopies, spectroscopies, and structural analysis for scientific and technological research
- **Energy Sciences Network (ESnet**), a high-speed computing network, data and connectivity backbone serving thousands of DOE scientists and collaborators worldwide.
- **Joint Genome Institute (JGI)** a center for genome sequencing and information sciences serving the scientific community and DOE missions in bioenergy, bioremediation, and carbon sequestration.
- **National Center for Electron Microscopy**, which houses TEAM, the world's highest resolution electron microscope, and other advanced microscopes and tools for electron micro-characterization of materials.
- **National Energy Research Scientific Computing Center (NERSC)**, a leading provider of high-performance computing tools and expertise that enable computational science of scale and complex scientific applications
- **Molecular Foundry**, a nanoscale science user facility for the characterization, design, and synthesis of "soft" (biological and polymeric) and "hard" (inorganic and microfabricated) building blocks and functional assemblies.

Recent Scientific Achievements

- Design and fabrication of the world's highest resolution electron microscope which images single atoms
- Development of nanostructured solid polymer electrolytes to enable rechargeable lithium-metal batteries
- Discovery of "dark energy," an antigravity force, through observation and computational data analysis
- Demonstration of the link between breast cancer and the surrounding extracellular matrix
- Sequencing more than 550 genomes, and their computational genome analysis and annotation
- Creation of the world's smallest electrical switch, smallest nano-radio, and the smallest motor
- Construction of the world's highest field dipole magnet
- Mathematical and computational models that provide ultra-high resolution analysis of turbulent flames
- First optical acceleration of electron bunches to GeV energies with narrow beam spread
- Observation of early structure of the universe in the microwave radiation afterglow of the Big Bang

Awards

With one-third of its scientific staff jointly affiliated with university campuses, LBNL delivers a highly distinguished science and engineering workforce for the nation's future. Founder Ernest Lawrence was the Laboratory's first Nobel Laureate and, following that tradition, many more have had significant research associations:

- 11 Nobel Laureates worked or are working at the Laboratory
- 84 memberships in the National Academies of Science, Engineering, and Medicine (affiliated)
- 13 National Medals of Science
- 3 Fermi Awards, 27 Lawrence Awards, 44 Industrial Research 100 Awards

OAK RIDGE National Laboratory

Leadership in Science

Oak Ridge National Laboratory (ORNL) is the Department of Energy's (DOE's) largest science and energy laboratory. Managed since April 2000 by UT-Battelle, a partnership of the University of Tennessee (UT) and Battelle Memorial Institute, ORNL was established in 1943 as a part of the Manhattan Project. As a world leader in a range of scientific areas supporting DOE's basic research, energy, national security, and environmental missions, ORNL is actively engaged in a variety of national and international partnerships with industry and educational institutions. As a DOE steward of critical national research infrastructure, ORNL provides access to university, industry, and government researchers on a competitive basis. The Laboratory hosts 3900 facility users and visiting scientists every year. The $1.4B Spallation Neutron Source (SNS), completed in 2006, and the upgraded High Flux Isotope Reactor (HFIR) will make ORNL the world's foremost center for neutron scattering and the Leadership Computing Facility (LCF) is DOE's most powerful computing complex for open scientific research. ORNL also manages the billion-dollar U.S. ITER project.

Lab-at-a-Glance

Location: Oak Ridge, TN

Type: Multi-program lab

Contract Operator: UT-Battelle (partnership between University of Tennessee and Battelle Memorial Institute)

Responsible Field Office: Oak Ridge Office (ORO)

Website: http://www.ornl.gov/

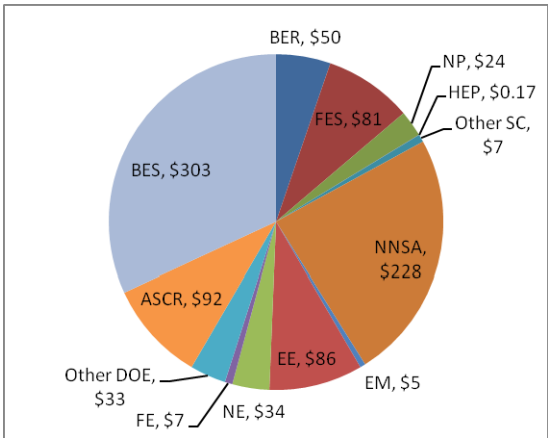
Physical Assets:
- 221 buildings
- 4,470 acres

Human Capital:
- 4,250 employees;
- 3900 Guests and Visitors

FY 2007 Total DOE Funding: $950.2M

FY 2007 DOE Funding by Source
(New BA in Millions):

FY 2007 Non-DOE Funding: $366M



Multi-Program Laboratory

As a multi-program laboratory, ORNL's funding comes from many sources: the Office of Science and its Basic Energy Sciences, Advanced Scientific Computing, Biological and Environmental Research, Fusion, Nuclear Physics, and High Energy Physics programs; Energy Efficiency and Renewable Energy programs, along with the Fossil Energy, Nuclear Energy programs, and Environmental Management, the National Nuclear Security Administration and Work for Others programs.

Mission

ORNL delivers its mission and customer focus, performs a complementary role in the DOE laboratory system, and provides leadership in the following areas:

- Delivering and sustaining the world's foremost center for neutron scattering
- Dramatically accelerating scientific discovery by delivering unparalleled capability in high-performance computational and data solutions applied to major problems in energy, environment, and national security
- Understanding and controlling nanoscale physical and chemical phenomena for the discovery of materials and interfacial processes with tailored properties through sustained leadership in synthesis, characterization, and theory
- Providing leadership in microbial and plant systems biology and environmental science, producing sustainable solutions to challenges in bioenergy, climatic change, and remediation
- Developing next-generation fusion and fission energy systems and energy-efficient technologies for transportation, buildings, and the electric power grid

- Delivering innovative technologies to limit or prevent the spread of weapons of mass destruction (WMD) materials, technologies, and devices, including developing new knowledge discovery tools, algorithms, materials, and open architecture detector systems to increase situational awareness

Core Competencies

Six core competencies underpin research activities at ORNL:

1. Neutron sciences, including neutron scattering studies of the structure and dynamics of materials at nanometer length scales and under extreme conditions
2. Computing and computational sciences at extreme scales
3. Comprehensive design, synthesis, and characterization of advanced materials and interfacial chemical processes
4. Biological and environmental sciences, including terrestrial ecosystems, climate sciences, microbial ecology, systems biology of plants, and bioconversion
5. Engineering sciences, including the nuclear fuel cycle, plasma science, electric power systems, combustion and thermal engineering, and radiochemical process technology
6. Counterterrorism and nonproliferation detection systems

Major User Facilities

- **Spallation Neutron Source:** world's most powerful pulsed neutron source
- **High Flux Isotope Reactor,** world's highest-flux reactor based neutron source
- **Leadership Class Computing Facility (LCF):** World's most powerful scientific computing complex.
- **Center for Nanophase Materials Sciences,** 309 unique users in FY07 at DOE's first nanoscience center
- **BioEnergy Science Center:** pioneer science leading to economical and sustainable biomass production and its conversion to biofuel and other products
- **High Temperature Materials Laboratory,** for advanced materials research
- **Holifield Radioactive Ion Beam Facility,** for nuclear physics and astrophysics research.
- **National Transportation Research Center,** for transportation technologies research

Recent Scientific Achievements

- Pioneered design and synthesis of new gyroid-phase (interconnecting) mesoporous carbons from the self-assembly of polymeric precursors, with potential in separations, fuel cells and battery applications.
- Synthesis, properties, and neutron scattering characterization of a new high-T_c superconductor, $LaFeAsO_{1-x}F_x$.
- *Proceedings of the National Academy of Sciences (PNAS)*: CO_2 emissions have sharply accelerated since 2000.
- Achievement of 42% diesel engine efficiency ("brake efficiency") in 2007, meeting a DOE Joule milestone.
- Simulation of high-power electromagnetic wave heating using the AORSA radio-frequency code on Jaguar at a record 87.5 teraflops, enabling ITER performance improvements.
- Study of diffusion dynamics of hydration water on the surface of rutile to low temperatures (a "first of" experiment) enabled by SNS.

Awards

- Two Nobel Prizes
- Seven Fermi Awards
- Inaugural James R. Schlesinger Award
- Thirteen E.O. Lawrence Awards
- 134 R&D 100 Awards, including 6 in 2007

Pacific Northwest NATIONAL LABORATORY

Leadership in Science

Pacific Northwest National Laboratory (PNNL) was created in 1965. In its early days, PNNL brought nuclear science and engineering expertise to the surrounding Department of Energy (DOE) Hanford Site to tackle projects focused on designing nuclear reactors, fabricating nuclear reactor fuel, and protecting the environment. Since then, PNNL has evolved into a multidisciplinary, Office of Science laboratory advancing scientific frontiers and developing innovative technologies for DOE and the nation. PNNL is operated by Battelle for DOE.

Multiprogram National Laboratory

In addition to the Office of Science, principal customers for PNNL include NNSA, EERE, FE, NE and EM as well as other government agencies, including the Departments of Homeland Security, Defense, Health and Human Services; the Nuclear Regulatory Commission, the intelligence community, and private industry. Total Laboratory funding in fiscal year (FY) 2007 was $843 million.

Mission

The Laboratory's mission focus is to deliver advances in the biological, chemical, computational, environmental and materials sciences and to rapidly translate scientific advances into solutions for challenges in energy production, storage and use; threat detection and prevention; and environmental management and sustainability.

Core Competencies

- Computational science and analytics
- Environmental science and technology
- Microbial and cellular biology
- Molecular science and engineering
- Radiological science and technology
- Signature and measurement science and technology

Major User Facilities

William R. Wiley Environmental Molecular Sciences Laboratory provides integrated experimental and computational resources for discovery and technological innovation in the environmental molecular sciences.

Atmospheric Radiation Measurement Climate Research Facility. PNNL provides technical direction for heavily instrumented field sites around the world for studying cloud formation processes and their influence on radiative transfer and for measuring other parameters that determine the radiative properties of the atmosphere.

Lab-at-a-Glance

Location: Richland, WA
Type: Multiprogram Laboratory
Contract Operator: Battelle Memorial Institute
Responsible Site Office: Pacific Northwest Site Office
Website: http://www.pnl.gov/

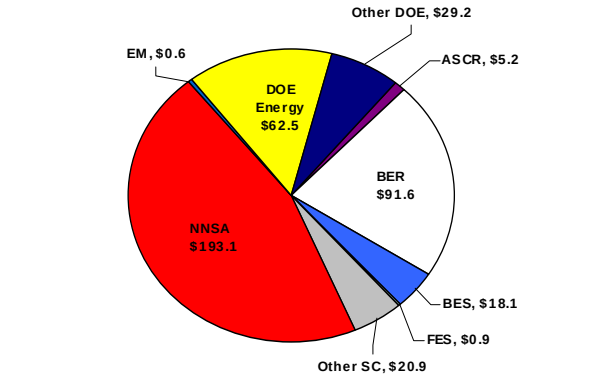
Physical Assets

- 350 Acres DOE, 250 Acres BMI
- 2,015,000 gsf Total—762,000 DOE (224,000 SC, 538,000 EM); 407,000 BMI; 846,000 Leased and Other
- Replacement Plant Value: $80M (SC Only)
- Deferred Maintenance: $41K
- Asset Condition Index: 100%
- Mission Critical 1.0 (Excellent)
- Mission Dependent N/A
- Asset Utilization Index: 1.0 (Excellent)

Human Capital

- 3816 FTEs
- 3302 Facility Users, Visiting Scientists, and Students

FY 2007 Total DOE Funding: $422.1M
FY 2007 Non-DOE Funding: $114.4M
FY 2007 Dept. Homeland Security: $123.1M
FY 2007 OHC/Other DOE Sites: $98.4M
FY 2007 1831/IP/Other: $85.0M



Recent Scientific Achievements

- Demonstrated that Shewanella bacteria can efficiently use either organic matter, such as reduced carbon, or hydrogen as an electron donor for pertechnetate reduction and other reductive processes - an important discovery with applications for in situ remediation and terrestrial carbon sequestration.
- Discovered that water can be hydrophobic – a discovery recognized by the American Institute of Physics' as a "Top Physics Story" in 2005.
- Developed and demonstrated a physically based treatment of indirect effect of aerosols on clouds to resolve a major uncertainty in climate model predictions of climate change. This treatment has been implemented in the Community Climate System Model of NCAR and other major climate models of the international climate change community.
- Discovered that pentavalent uranium is stable on mineral surfaces in aqueous solutions.
- Discovered and characterized the first examples of fluorescent technetium complexes in support of the development of pertechnetate sensors applicable to Hanford vadose zone and other DOE sites.
- Developed the Global Arrays toolkit to provide an efficient, portable, shared-memory interface for distributed memory, high performance computers.
- Discovered, using advanced NMR techniques, that materials intended to entrap nuclear waste for hundreds of thousands of years may be susceptible to structural breakdown within 1,400 years.
- Developed a breakthrough advancement in active, confocal 350GHz electromagnetic imaging technology that enables stand-off detection of explosives up to ten meters.
- Obtained data and provided technical analyses to update codes and standards for building envelope, mechanical systems, and lighting. This work is estimated to have saved consumers $7 billion dollars since 1992 and will save the equivalent of 2.7 quadrillion Btus by the year 2030 if the improved codes are fully implemented by states.

Awards

- 2008 Christopher Columbus Homeland Security Award
- 2008 National Intelligence Medal of Achievement
- 2007 E.O. Lawrence award in Environmental Science
- 2007 Glen T Seaborg award in actinide chemistry
- Major contributor to the 2007 IPCC 4th Assessment Report
- 2007 Humboldt Award in Nanoscience
- 2007 ACS Field and Franklin Award in Mass Spectrometry
- 2006 and 2007 Presidential Early Career (PECASE) Awards
- 2006 StorCloud award
- 2006 Schoenbein Medal for Fuel Cells
- 13 Federal Laboratory Consortium awards in the last 5 years; 67 total
- 16 R&D 100 awards in the last 5 years; 74 total.
- 51 staff elected professional society fellows in last 5 years

Leadership in Science

Princeton Plasma Physics Laboratory is a world leader in the development of fusion as an inexhaustible, safe, and environmentally attractive means of generating electricity and hydrogen for the long-term. The Laboratory is studying the magnetic confinement of hot ionized gas, or plasma, as the fuel for fusion energy production. Magnetic fusion research at Princeton began in 1951 under the code name Project Matterhorn. Today the lab, located on the University's James Forrestal Campus in Plainsboro, NJ, is a leader in the integrated design, fabrication, and operation of experimental facilities for fusion research and for basic and applied plasma research. Operated by Princeton University, PPPL has an annual budget of about $77 million.

Single-Program Laboratory

PPPL is a single-program laboratory supported by DOE's Office of Science's Fusion Energy Sciences program.

Mission

PPPL is a collaborative national center for plasma and fusion science. Its primary mission is to develop the scientific understanding and the key innovations that will lead to an attractive fusion energy source. Associated missions include conducting world-class research along the broad frontier of plasma science and providing the highest quality of scientific education.

Core Competencies

- Experimental analysis of stability and confinement of fusion plasmas.
- Plasma theory and computational physics for fusion and other applications.
- Physics and engineering design and operation of experimental plasma fusion facilities, using tritium, which produced world-record levels of fusion power.
- Computer engineering, including data acquisition, instrumentation, and control systems.
- Physics and technology of plasma applications to advance industrial technologies.
- Environmental, safety, and health aspects of the operation and removal of experimental fusion devices.

Lab-at-a-Glance

Location: Princeton, NJ

Type: Single-program lab

Contract Operator: Princeton University

Responsible Field Office: Princeton Site Office

Website: http://www.pppl.gov/

Physical Assets:

- 88 acres; 36 buildings
- 721 GSF in Active Operational Buildings
- 1K in Non-Operational Buildings
- Replacement Plant Value: $310M
- Deferred Maintenance: $9.4M
- Asset Condition Index:
  - Mission Critical 0.97 (Excellent)
  - Mission Dependent 0.91 (Adequate)
- Asset Utilization Index: 0.97 (Good)

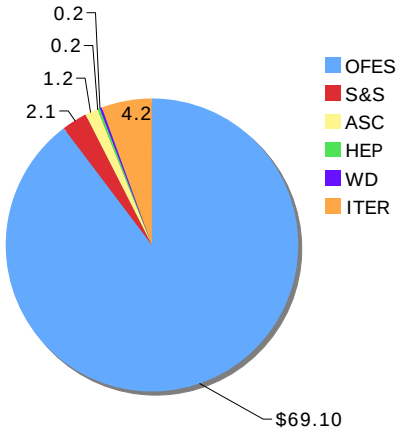
Human Capital:

- 475 FTEs
- ~250 Facility Users and Visiting Scientists

FY 2007 Total DOE Funding: $77.0M

FY 2007 DOE Funding by Source

PALS data (BA in Millions):



FY 2007 Non-DOE Funding: $1.2M

Major User Facilities

- **ITER,** PPPL is a partner with the Oak Ridge National Laboratory, the designated U.S. Project Office for the ITER international fusion experiment.
- **National Spherical Torus Experiment (NSTX)**, studying the spherical torus plasma confinement configuration.

- **National Compact Stellarator Experiment (NCSX)**, a device to study a compact stellarator confinement configuration. Construction is now underway, with operation scheduled for 2013.

Recent Scientific Achievements

- NSTX achieved its plasma current design specification (1 MA) nine months ahead of schedule.
- NSTX achieved record beta values approaching 40%. Beta relates to the economics of fusion power production.
- NSTX sustained high normalized beta and energy confinement with up to 70% of plasma current provided without transformer action.
- NSTX demonstrated suppression of anomalous ion energy and particle transport over majority of plasma.
- NSTX demonstrated importance of multi-mode effects in fast-ion transport caused by Alfvén instabilities.
- NSTX demonstrated factor of 3 reduction in peak exhausted heat flux by enhancing divertor radiation.
- NSTX achieved high electron temperature > 4keV using high-frequency fast Alfvén wave heating.
- NSTX achieved record plasma initiation currents up to 160kA using magnetic helicity injection.
- NCSX completed construction of the vacuum vessel and coil winding forms.
- NCSX fabricated 16 of 18 coils.
- NCSX completed first coil to coil mating within required tolerances.
- Magnetic Reconnection Experiment (MRX) provided a comprehensive picture of driven magnetic reconnection, significantly impacting theory for both laboratory and space plasmas.
- Current Drive Experiment-Upgrade (CDX-U) conducted the world's first demonstration of tokamak plasma performance improvement with large area liquid lithium plasma-facing components.

Awards

- One Nobel Prize
- Three E.O. Lawrence Awards
- Seven James Clerk Maxwell Prizes
- Two R&D 100 Awards

Leadership in Science

Stanford Linear Accelerator Center (SLAC) is operated by Stanford University for the Department of Energy's Office of Science. SLAC was founded in 1962 to perform accelerator-based particle physics. The Laboratory mission has since broadened to include photon science and non-accelerator-based particle physics.

SLAC has an operating budget of about $215 million. It employs approximately 1,500 Full Time Equivalents of staff and accommodates approximately 3,000 students and visiting scientists from the U.S. and around the world each year.

Multi-Program Laboratory

SLAC is a DOE Office of Science laboratory. Some programs are joint initiatives with other agencies, such as the Stanford Synchrotron Radiation Laboratory, with the National Institutes of Health, and the Gamma Ray Large Areas Space Telescope, with the National Aeronautics and Space Administration.

Mission

SLAC's programs explore the ultimate structure and dynamics of matter and the properties of energy, space and time—at the smallest and largest scales, in the fastest processes, and at the highest energies. Through our investigations into the structure of matter and how it behaves on multiple timescales, length scales, and energy scales we address fundamental questions that span a broad range of science challenges including:

- Understanding the basic science of matter
- Investigations of materials related to energy and the environment
- Probing the organizing principles of bio-materials and processes
- Elucidating the fundamental forces and constituents of the universe

Core Competencies

The foundational core competencies underpinning activities at SLAC are:

- Electron-based accelerator research and technology
- Advanced instrumentation, diagnostics, and systems integration
- Innovative techniques for data analysis, modeling, simulation, and theory in Photon Science, Particle Physics and Particle Astrophysics
- Management of ultra-large data sets for users and collaborations distributed worldwide

Lab-at-a-Glance

Location: Menlo Park, CA

Type: Multi-program Laboratory

Contract Operator: Stanford University

Responsible Field Office: Stanford Site Office

Website: www.slac.stanford.edu

Physical Assets:

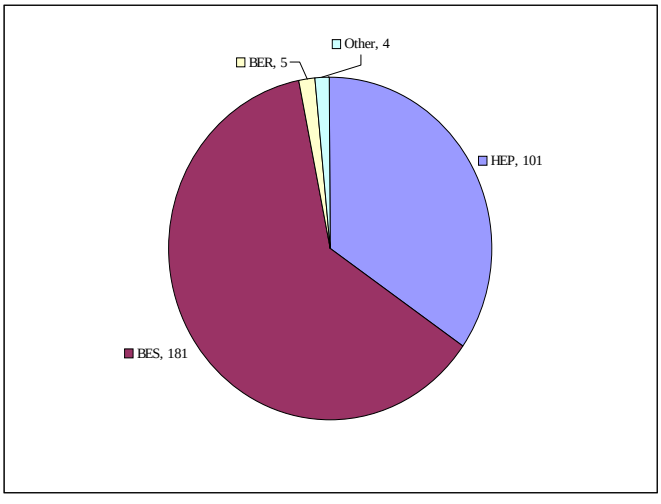
- 426 Acres
- 145 Buildings
- 1.8M GSF in Active Operational Buildings
- Replacement Plant Value: $987M
- Deferred Maintenance: $36.3M
- Asset Condition Index:
  - Mission Critical 0.94 (Adequate)
  - Mission Dependent 0.94 (Adequate)
  - Not Mission Critical 0.99 (Excellent)
- Asset Utilization Index: 99.9% (Excellent)

Human Capital

- Employees: 1,496 FTE as of 4/15/08
- Users, Visiting Scientists and Grad Students: 3036 Head Count

FY 2008 Total DOE Funding: $290.7M

FY 2008 DOE Funding by Source *(BA in Millions):*



FY 2008 Non-DOE Funding: $16.5M

Major User Facilities

Major SLAC facilities that support the user community include the Linac Coherent Light Source (LCLS), currently under construction. LCLS, the world's first X-ray free-electron laser, positions SLAC to become the world leader in the exciting new field of ultrafast X-ray science. SLAC operates a forefront synchrotron light source program, the Stanford Synchrotron Radiation Laboratory (SSRL), which provides a resource to the user community for probing the electronic and atomic structure of matter. The B-factory, an electron-positron collider, completed operations in FY08, but an intensive data analysis program will continue for several years. SLAC is home to the Instrument Operations Center for the Large Area Telescope instrument on the Gamma Ray Large Area Space Telescope (GLAST) scheduled to be launched in FY08.

Recent Scientific Achievements

- Construction of the world's first X-ray free electron laser, producing 100 femtosecond pulses of photons in the energy range 800-8,000 eV. First experiments will commence in 2009.
- High reliability, stable X-ray beams from intermediate energy 3rd generation synchrotron light source
- World's highest energy, low emittance electron beams from the SLAC Linac
- Successful completion of the running of the B-factory. More than 300 peer reviewed research papers have come from BaBar to date
- Successful completion of the Large Area Telescope instrument for GLAST, which will map the gamma ray sky starting after launch in 2008

Awards

- Six scientists have been awarded the Nobel Prize for work carried out at SLAC.
- Ten SLAC Scientists have been elected members of the National Academy
- Six SLAC Scientists have been awarded the DOE E. O. Lawrence Award
- Two SLAC Scientists have been awarded the DOE Fermi Award

The Department of Energy's Office of Science

The U.S. Department of Energy's Office of Science is the single largest supporter of basic research in the physical sciences in the United States, providing more than 40 percent of total funding for this vital area of national importance. It oversees—and is the principal federal funding agency of—the Nation's research programs in high energy physics, nuclear physics, and fusion energy sciences.

The Office of Science sponsors fundamental research programs in basic energy sciences, biological and environmental sciences, and computational science. In addition, the Office of Science is the Federal Government's largest single funder of materials and chemical sciences, and it supports unique and vital parts of U.S. research in climate change, geophysics, genomics, life sciences, and science education.

The Office of Science manages this research portfolio through six interdisciplinary program offices: Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics, and Nuclear Physics. In addition, the Office of Science sponsors a range of science education initiatives through its Workforce Development for Teachers and Scientists program.

The Office of Science makes extensive use of peer review and Federal advisory committees to develop general directions for research investments, to identify priorities, and to determine the very best scientific proposals to support.

The Office of Science also manages 10 world-class laboratories, which often are called the "crown jewels" of our national research infrastructure. The national laboratory system, created over a half-century ago, is the most comprehensive research system of its kind in the world.

Five are multi-program facilities: Argonne National Laboratory, Brookhaven National Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory. The other five are single-program national laboratories: Ames Laboratory, Fermi National Accelerator Laboratory, Thomas Jefferson National Accelerator Facility, Princeton Plasma Physics Laboratory, and Stanford Linear Accelerator Center.

The Office of Science oversees the construction and operation of some of the Nation's most advanced R&D user facilities, located at national laboratories and universities. These include particle and nuclear physics accelerators, synchrotron light sources, neutron scattering facilities, supercomputers and high-speed computer networks. Each year these facilities are used by more than 19,000 researchers from universities, other government agencies, and private industry.

The Office of Science is a principal supporter of graduate students and postdoctoral researchers. About 50 percent of its research funding goes to support research at more than 300 colleges, universities, and institutes nationwide.

The Office of Science also reaches out to America's youth in grades K-12 and their teachers to help improve students' knowledge of science and mathematics and their understanding of global energy and environmental challenges.

To attract and encourage students to choose an education in the sciences and engineering, the Office of Science also supports the National Science Bowl, an educational competition for high school students involving all branches of science. Each year, over 12,000 students participate in the contest, and some 300 finalists typically prepare for months to attend the national event in Washington, D.C.

www.science.doe.gov

Office of Science National Laboratories

Ames Laboratory
111 TASF
Ames, IA 50011-3020
Phone: (515) 294-9557
http://www.ameslab.gov/

Argonne National Laboratory
9700 S. Cass Avenue
Argonne, IL 60439
Phone: (630) 252-2000
http://www.anl.gov/

Brookhaven National Laboratory
P.O. Box 5000
Upton, NY 11973-5000
Phone: (631) 344-8000
http://www.bnl.gov/

Fermi National Accelerator Laboratory
P.O. Box 500
Batavia, IL 60510-0500
Phone (630) 840 3000
http://www.fnal.gov/

Thomas Jefferson National Accelerator Facility
12000 Jefferson Avenue
Newport News, VA 23606
Phone: (757) 269-7100
http://www.jlab.org/

Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley, CA 94720
Phone: (510) 486-4000
http://www.lbl.gov/

Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, TN 37831
Phone: (865) 574-4160
http://www.ornl.gov/

Pacific Northwest National Laboratory
902 Battelle Boulevard
Richland, WA
Phone: (509) 375-2121
http://www.pnl.gov/

Princeton Plasma Physics Laboratory
P.O. Box 451
Princeton, NJ 08543-0451
Phone: (609) 243-2000
http://www.pppl.gov/

Stanford Linear Accelerator Center
2575 Sand Hill Road
Menlo Park, CA 94025
Phone: (650) 926-3300
http://www.slac.stanford.edu/